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The Lighting of Airplane Landing Fields

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THE introduction of night flying on a commercial basis created several new problems, particularly those that are concerned with illumination. The aviator flies from one to several thousand feet above the ground in utter darkness and he has to rely for his course on a well-lighted airway, and for his landing on a well-lighted landing field. The lighting of airways is a subject of its own, and here we are more particularly concerned with the lighting of landing fields.

Landing fields are equipped with several types of lighting, depending on the purposes for which they are intended. Taken in the order in which the aviator approaches the landing field, they are:

The revolving beacon, which indicates to the aviator the location of the landing field when he is still a considerable distance away.

The boundary lights, which must clearly show to the aviator the outline of the field as he is approaching.

The marker lights, which give him the most favorable points of approach.

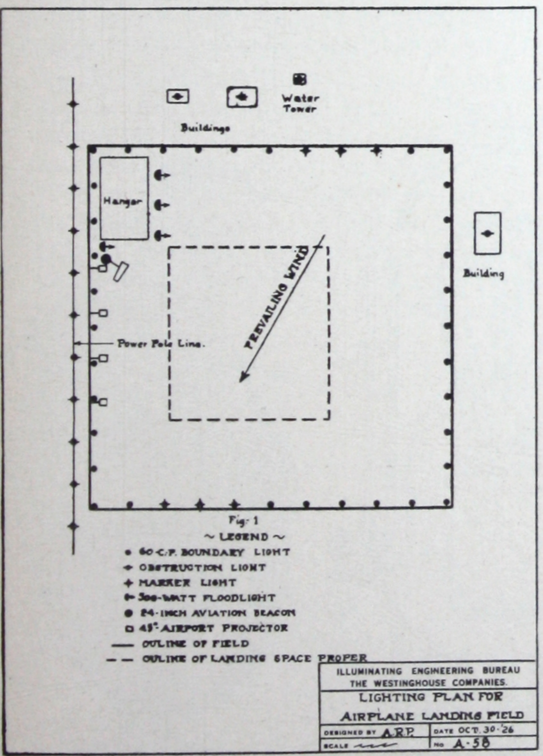

FIG. 1

The lights illuminating the wind cone, which indicates to him the prevailing direction of the wind against which he has to land.

The obstruction lights, which warn him of any dangerous obstacles which he has to clear.

The landing field floodlights, which illuminate that portion of the landing field proper on which the aviator makes his landing.

The local lighting used for illuminating his final goal, the hangars and the approach thereto.

It is common practice to use white lights for illumination purposes, green lights for most favorable approach, and red lights for obstacles and danger. The landing field lights with which the airplane itself is equipped, are purposely ignored here, as on account of the nature of their construction, their light weight, and the heavy shocks they are sometimes subjected to in landing, they should be used only as auxiliary or emergency equipment.

Figure 1 is a plan view of a typical landing field showing the position of the various lighting units.

The revolving beacon is essentially a 1,000-watt projector sending out a beam of about 5° spread. The projector is revolved by means of a small electric motor about six times per minute in a horizontal plane, causing the beam to sweep the horizon. The beam is tilted slightly upward so that it strikes the approaching aviator's eye. Figure 2 is a typical beacon of this type. It is identical with the type of beacons which are used on airways and have proved exceedingly satisfactory. The beacon is usually mounted on one of the hangars or in close proximity thereto at a height of approximately 50 feet above ground level.

For boundary lights, vapor-proof fixtures are usually employed. They have upward-pointing lamps protected by heavy glass globes and are water-tight and dust-proof. A heavy wire cage over the glass globe adds further protection. These units are mounted at a distance of about 3 feet above the ground level and are usually spaced at 200-foot intervals all around the field. Figure 3 shows a typical unit of this kind.

The marker lights differ from the boundary lights only in that the globe which covers the lamp is of green glass, thus throwing off a green light. They are used in pairs or in sets of three in place of the boundary lights, to indicate the most favorable approach.

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The wind cone lights are provided to clearly outline the wind cone, and advise the aviator of the direction of the wind. They should give a fairly high intensity of illumination. For this purpose the units shown in Figure 4 have proved quite satisfactory.

The obstruction lights differ from the boundary lights only in that the globe is of ruby-colored glass. They should be mounted on all high structures such as water-towers, trees, etc., and high buildings within the field or in close proximity thereto in order to lessen the danger of collision on the part of the aviator.

The landing field floodlights are a more recent development. They are of the greatest importance, as the safety of aviator and plane is dependent thereon. They must be mounted outside of the landing field proper, and their light must have sufficient penetration to illuminate an area of from 700 to 1,000 feet in width and 1,000 to 1,500 feet in length located toward the center of the field. They also must be mounted low so as not to interfere with the aviator's leveling off. They must be non-glaring so that, if the aviator has to fly into them because of prevailing wind conditions, he is not blinded by the beam. Their light should be fairly uniform in intensity and not too bright. An aviator coming out of the dark cannot quickly enough adjust his eyes to a bright light, and, in fact, where exceedingly bright lights are used, aviators prefer to land in the darker portion of the illuminated area.

There is another important consideration. An airplane landing field may have been planned for light travel with only one airplane landing at a time and with considerable interval between landings. In a very short space of time, the conditions may change and the traffic may become quite heavy. This greater traffic will need a greater area of illumination. It is important, therefore, that the method of lighting be such that the lighted area can be increased readily and at minimum expense. All these considerations would lead to the use of several smaller units in preference to a large concentrated unit. With several smaller units, the glare, if any, is split up and the illumination is more uniform, because of the fact that with proper spacing the beams in the further distance overlap, as is plainly shown in Figure 5. Furthermore, the lights can be adjusted to follow the strip of ground in front of them, and thus fields that are not entirely level can be readily illuminated by individual adjustment of the units. And if some time after installation it is found that the illumination should be increased either in intensity or in area, it is easy to add to the number of units and space them at shorter intervals. Another important factor is the greater security of operation obtained by the use of several units. If the lamp in one of these units should fail at a critical moment, the other units will still give

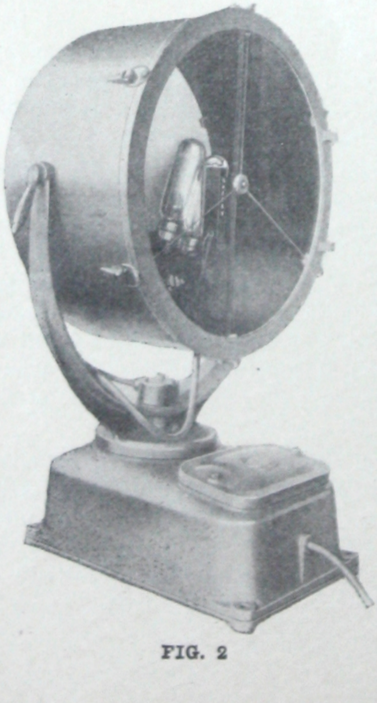


FIG. 2

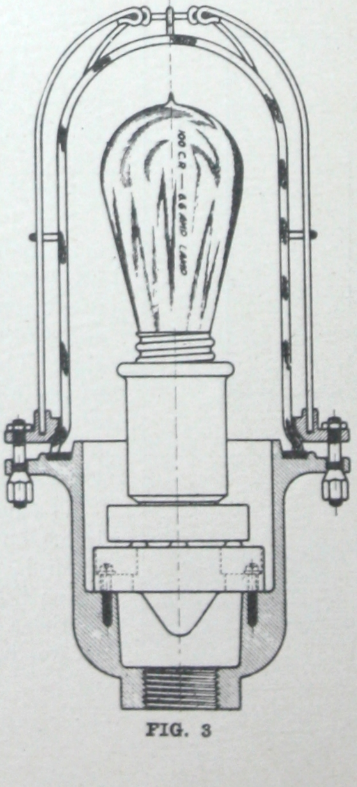


FIG. 3

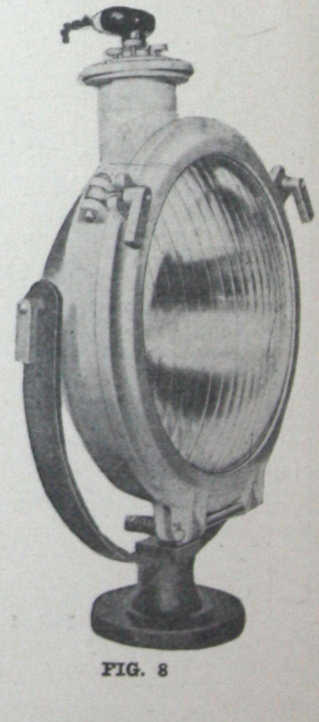


FIG. 8

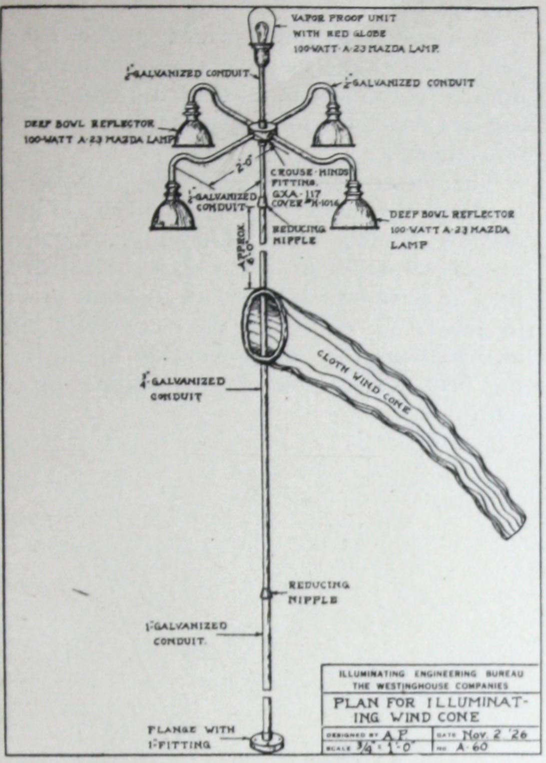


FIG. 4

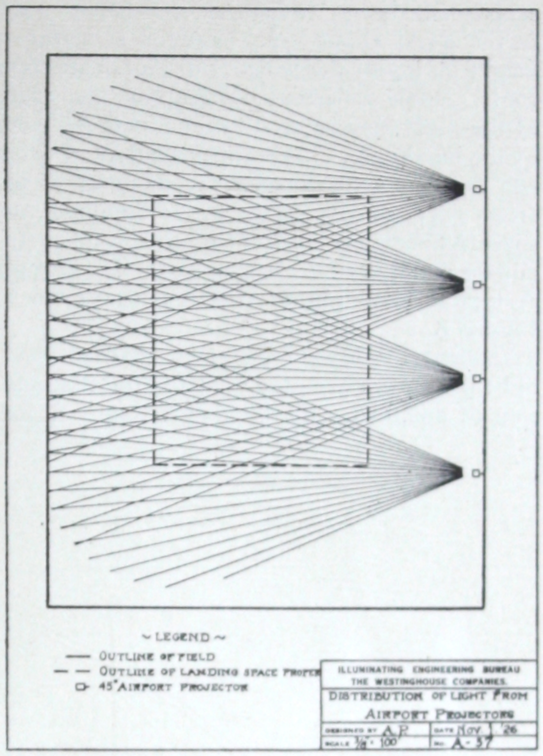

~ LEGEND ~
OUTLINE OF FIELD
OUTLINE OF LANDING SPACE PROPER
45° AIRPORT PROJECTOR
ILLUMINATING ENGINEERING BUREAU
THE WESTINGHOUSE COMPANIES.
DISTRIBUTION OF LIGHT FROM AIRPORT PROJECTORS
DESIGNED BY A.P.
DATE Nov. 1 '26
SCALE 1/8" = 100'
NO. A-57

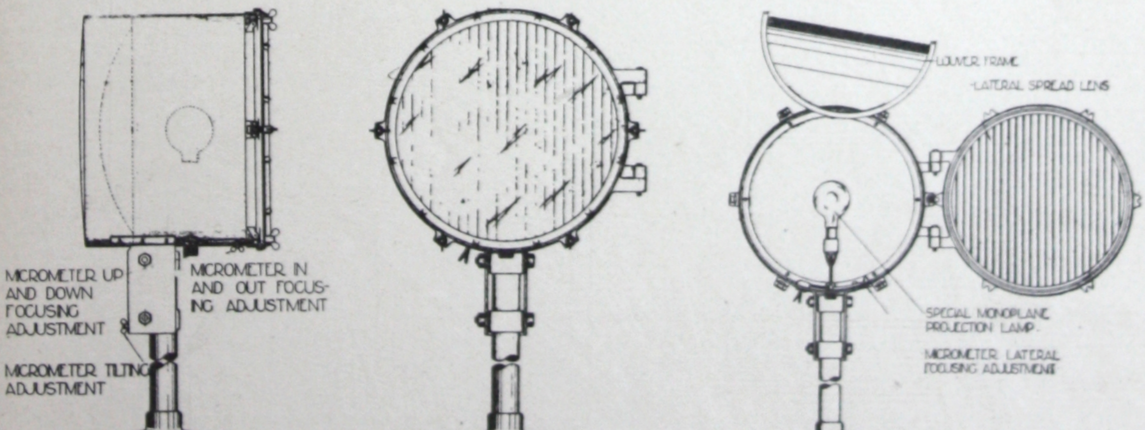
FIG. 5

sufficient light to allow the aviator to make a safe landing.

Figures 6 and 7 show a typical unit of this type, which is characterized by a 24-inch reflector with a long focal distance so as to produce a very concentrated beam. This beam is fanned out by a spread lens which produces a horizontal divergence of about 45°. A system of louvers is provided to intercept all upward-directed rays. Thus, with the unit placed slightly below the height of the average aviator's eyes and tilted forward so that the upper rays are slightly below horizontal, practically no rays will hit the aviator's eyes, and the glare which has proved so objectionable heretofore is practically eliminated. The aviator can safely land against the lights if the direction of the wind forces him to do so. The unit is entirely dust-proof and rain-proof.

Three to six of these lights are usually placed along the center of one of the boundary lines most nearly parallel to the direction of the prevailing wind. They are usually spaced 300 to 350 feet apart, their exact spacing and number depending on local conditions.

The local lighting of the hangars is best


MICROMETER UP AND DOWN FOCUSING ADJUSTMENT
MICROMETER IN AND OUT FOCUSING ADJUSTMENT
MICROMETER TILTING ADJUSTMENT
LOUVER FRAME
LATERAL SPREAD LENS
SPECIAL MONOPLANE PROJECTION LAMP.
MICROMETER LATERAL FOCUSING ADJUSTMENT

FIGS. 6 AND 7

accomplished by industrial reflectors, such as the RLM Dome type, mounted at sufficient height on top of the hangars to illuminate their roofs. Angle reflectors overhanging the edges of the roofs may be used to illuminate the sides of the buildings. Floodlight projectors of from 500 to 1,000-watt capacity are mounted at the front edge of the hangars to illuminate the space immediately in front of them and to facilitate guiding the airplane into the hangar. A typical floodlight of this type is shown in Figure 8.

Industrial lighting fixtures or standard floodlight projectors are also used for the illumination of administration buildings, supply depots and the like.

In isolated locations where power from a central station may not be available, small generating sets similar to those used for farm lighting are employed to supply the necessary electric current.

The above-described methods may be said to cover the latest practice in the lighting of airplane landing fields. They are the outcome of several years of costly experimenting and they all have been adopted as standard practice by the U. S. Army Air Service. With slight modifications they are applicable to any landing field, irrespective of size, outline, or contour.

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